1/6/16 "A mistake is food for a new invention." -Anonymous

HW: "Curve Sketching HW" #1, 2
Test 3 on Thursday 1/12

AIM: How do we Sketch Curves?

Warm Up:

Start #1 on the worksheet

CURVE SKETCHING

Guidelines for Analyzing the Graph of a Function

1. Find domain and range.
2. Find *x*- and *y*-intercepts, vertical and horizontal asymptotes, symmetry of graph.
3. Find critical points and intervals where increasing and decreasing. (1st Derivative)
4. Determine local max. and min. points.
5. Determine concavity and find points of inflection. (2nd Derivative)
6. Sketch the curve.

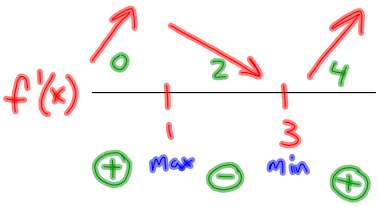
EX. #1: $f(x) = x^3 - 6x^2 + 9x - 2$

Domain: $(-\infty, \infty)$
Range: $(-\infty, \infty)$

$f'(x) = 3x^2 - 12x + 9$

$3x^2 - 12x + 9 = 0$
$3(x^2 - 4x + 3) = 0$
$(x-3)(x-1) = 0$
$x = 3 \quad x = 1$

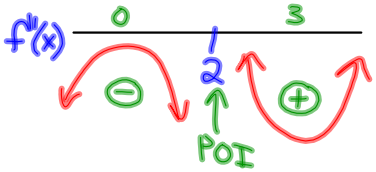
Test #
Critical #
Sign $f'(x)$



$f''(x) = 6x - 12$

$6x - 12 = 0$
$6(x-2) = 0$
$x = 2$

Test #
Critical #
Sign $f''(x)$



Points: $x^3 - 6x^2 + 9x - 2$

Max @ $x = 1$ $(1)^3 - 6(1)^2 + 9(1) - 2 = 2$ Max @ $(1, 2)$

Min @ $x = 3$ $(3)^3 - 6(3)^2 + 9(3) - 2 = -2$ Min @ $(3, -2)$

POI @ $x = 2$ $(2)^3 - 6(2)^2 + 9(2) - 2 = 0$ POI @ $(2, 0)$

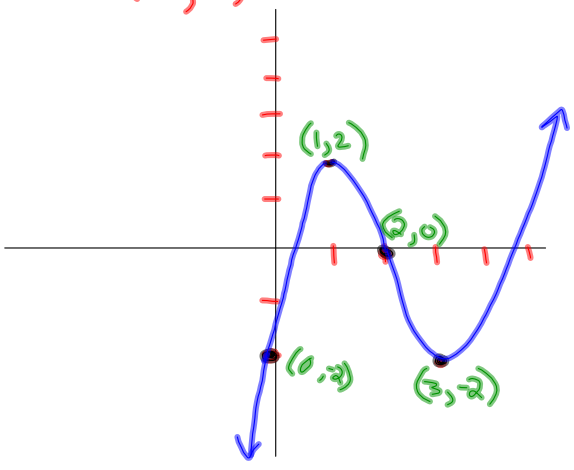
y-intercept: $x = 0$ $(0)^3 - 6(0)^2 + 9(0) - 2 = -2$ y-int $(0, -2)$

Increasing: $(-\infty, 1) \cup (3, \infty)$

Decreasing: $(1, 3)$

Concave Up: $(2, \infty)$

Concave Down: $(-\infty, 2)$



Ex. #2: $f(x)=\frac{x^2+1}{x^2-9}$

$f'(x)=$

$f''(x)=$

Test #

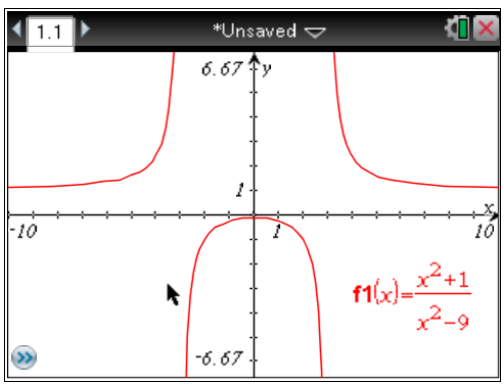
Critical # _____

Sign $f'(x)$

Test #

Critical # _____

Sign $f''(x)$



EX. #3: $f(x) = (x^2 - 1)^3$

$f'(x) =$ $f''(x) =$

Test #

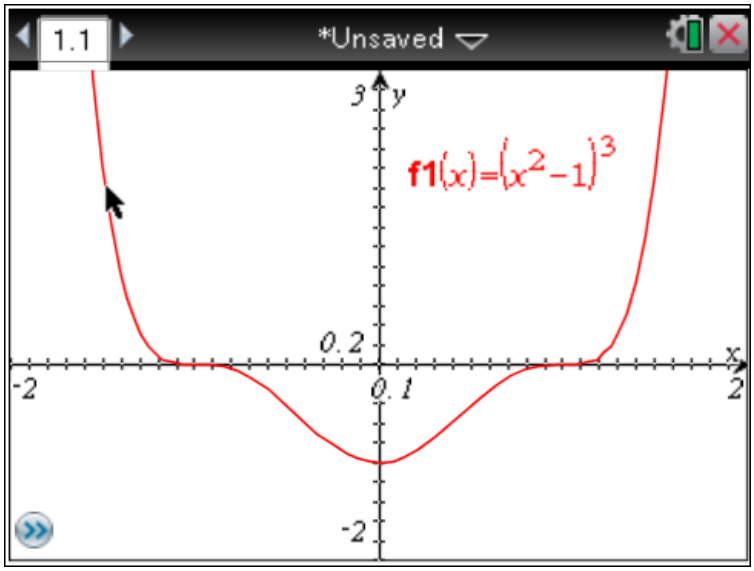
Critical # _____

Sign $f'(x)$

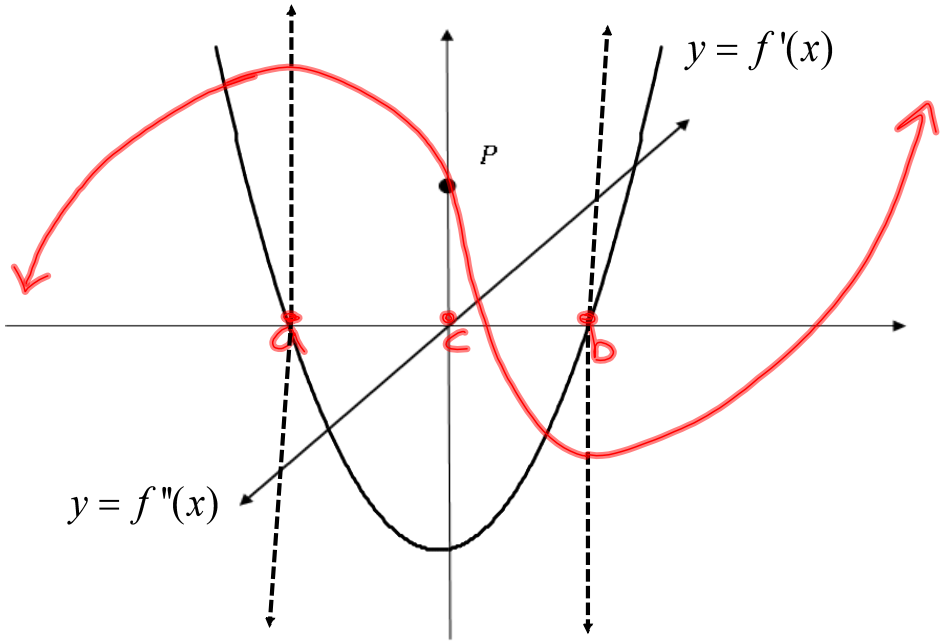
Test #

Critical # _____

Sign $f''(x)$

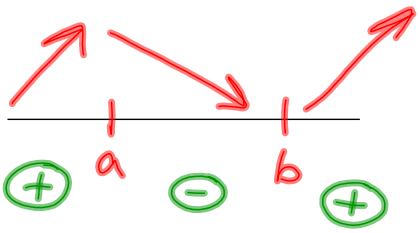


Graphing f from graphs of f' and f''

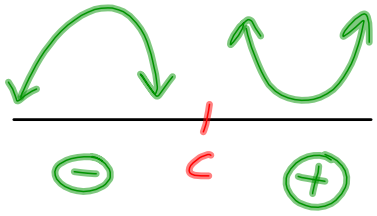


Can you sketch a possible graph of f that passes through the point P?

Test #
Critical #
Sign $f'(x)$



Test #
Critical #
Sign $f''(x)$



Interval/Point	$(-\infty, a)$	(a, c)	(c, b)	(b, ∞)
$f'(x)$	+	−	−	+
$f''(x)$	−	−	+	+
Inc/Dec	Inc	Dec	Dec	Inc.
Concave up Concave down	Down	Down	Up	Up

Recall:

$f'(x) > 0$ $f(x)$ is increasing

$f'(x) < 0$ $f(x)$ is decreasing

$f'(x) = 0$ Possible Max/Min on $f(x)$

$f''(x) > 0$ $f(x)$ is Concave Up

$f''(x) < 0$ $f(x)$ is Concave Down

$f''(x) = 0$ Possible point of inflection on $f(x)$